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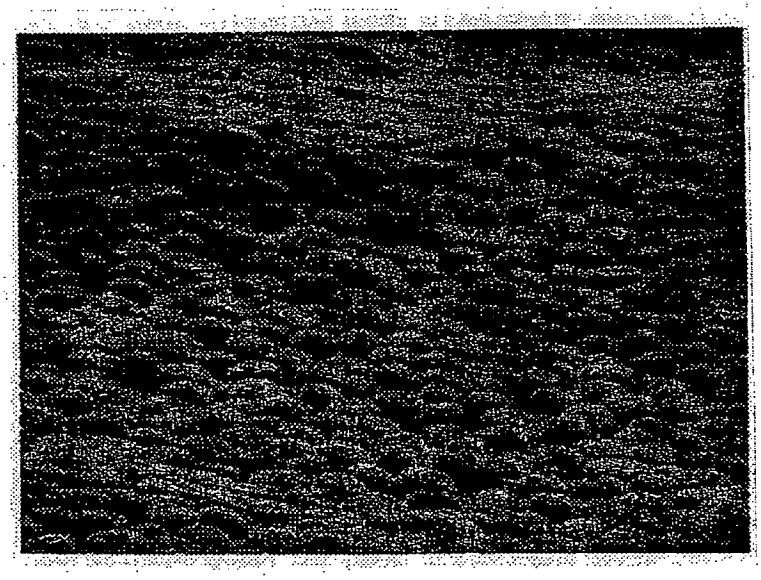

(57) Abstract

A paper or paperboard comprising a cellulosic fiber basestock and an ink-receptive coating containing organic polymeric non-film forming particles, a paper or paperboard comprising a cellulosic fiber based stock, a mineral pigment-containing basestock on at least one surface of the basestock and an ink-receptive coating of organic polymeric non-film forming particles overlying the basecoat, and a paper useful in printing magazines and catalogs are disclosed.

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PRINTING PAPER

Background

The present invention relates to an improved printing paper or paperboard and, more particularly to a printing paper or paperboard in which an ink-receptive layer containing an organic polymeric, pigment is provided on a basestock. The basestock may be uncoated or coated with a mineral-containing basecoat. The present invention is particularly useful in publishing magazines and catalogs where lighter weight enamel grade papers exhibiting good stiffness are desired .

Printing papers are specially manufactured to provide printers with properties such as improved ink holdout, print gloss and dot fidelity which contribute to superior print quality. The techniques that have been used conventionally to manufacture printing papers can be considered in two groups, namely, those used in manufacturing uncoated papers and those used in manufacturing coated papers.

The techniques which have been used to prepare uncoated papers rely upon calendering to provide a smooth, less porous surface. These techniques may also involve the application of surface sizes and other agents such as brighteners to the sheet. The application of starch and other sizing agents to the surface of the sheet is relied upon to provide a less porous surface with improved ink holdout. As contrasted with the properties achieved in coated papers, uncoated papers are generally lower in print quality than coated papers because uncoated papers are generally less smooth and more porous and exhibit poor ink hold out and dot fidelity relative to coated papers. The print quality of uncoated papers can be improved by calendering to increase smoothness and decrease porosity; however, such calendering reduces the stiffness of the sheet. The resulting uncoated paper still generally exhibits poor ink hold out relative to coated papers.

The coated paper products known in the art are coated on at least one side and most commonly coated on both sides with a coating layer containing mineral pigments and

binders. The most commonly used pigments are clay and calcium carbonate. The coat weight is typically 6 to 18 g/m^2/side. The pigments are fixed to the paper with an adhesive or binder such as styrene butadiene copolymer, acrylic polymer, vinyl alcohol polymer, vinyl acetate polymer, or natural binders such as starch, proteins, caseins, etc. or any combinations thereof. In some cases, the coating pigments have been applied in two layers, namely a basecoat in which less expensive materials such as calcium carbonate and starch are used and an ink receptive layer in which more expensive materials such as fine, high brightness clays, synthetic pigments, and latex are used.

As printing technology has progressed, coated papers have been required to achieve high quality printing characteristics. A thinner ink film will print an image of greater sharpness and density on a coated paper than will a thicker ink film on uncoated paper. In addition to providing printing ink holdout and smoothness as in uncoated calendered papers, coated papers provide gloss, shade, opacity, and brightness. The size, packing characteristics and surface properties of the coating pigments influence the interaction of ink with the coated paper surface to produce the desired visual impact.

The term "coating color" is used in the paper and printing industry to refer to mixtures of pigments, adhesives and additives which are dispersed in water and applied to paper. Clay, calcium carbonate, titanium dioxide and plastic pigments are commonly used pigments in coating colors. Clays are generally lower in brightness than calcium carbonates, but coatings containing high amounts of calcium carbonates typically exhibit poor ink gloss and ink holdout. Due to the variation in mineral pigment size, shape and size distribution, the pore structure of many coated papers can be irregular resulting in a tendency for the binder to migrate non-uniformly during the drying process. Non-uniform distribution of the binder in the coating can cause print mottle. As a result of these problems, it is often difficult using conventional coating colors to achieve a coated paper with high brightness, high gloss and a uniform non-mottled printed surface.

Synthetic organic pigments have previously been added to coating colors in amounts that are generally much less than the amount of the mineral pigments to improve gloss on calendering. The pigments have been used to contribute gloss to the finished sheet. Synthetic pigments also contribute bulk to the finished paper as a result of their lower density relative to mineral pigments.

Summary of the Invention

In accordance with the present invention, a paper or paperboard is provided which comprises a cellulose fiber basestock having a coating of organic polymeric, non-film forming particles on at least one surface. Preferably, the organic polymeric coating contains at least 50% by volume of organic polymeric, non-film forming particles on at least one surface of the basestock. One manifestation of the invention is a paper or paperboard which comprises a cellulose fiber basestock having on at least one surface, a coating containing organic polymeric, non-film forming particles. Another manifestation of the invention is a paper or paperboard which comprises a cellulose fiber basestock having on at least one surface, a basecoat containing mineral pigments and an ink-receptive overcoat containing organic polymeric non-film forming particles. The term "non-film forming" is used herein in the ordinary sense of the words to mean that the organic polymeric particles do not form a film over the range of temperatures and pressures normally encountered in coating, drying, and calendering paper, although said particles may form a film if subjected to much higher temperatures and pressures. The paper of the invention is particularly useful in applications where a combination of high printing quality, stiffness, and light weight is desired such as in magazine and catalog publishing where higher weight papers can add substantially to publication and mailing costs, but not limited to these applications. The paper is characterized in that the basestock has a basis weight of about 30 to 200 g/m^2/side and the coated paper is calendered to a smoothness less than 3.50 (PPS-5H) and a 75 TAPPI gloss greater than 20 and preferably greater than 50. Preferably, the particles in the ink-receptive coating have an average particle size of about 0.1 to 5.0 microns and are closely packed such that the average center-to-center spacing of the particles is about 1.0 to 2.0 times the average

particle size. The term "particle size" as used herein refers to the largest particle dimension. In the case of a spherical particle it is the diameter. By closely packing the particles, the particles provide a physically and chemically uniform ink-receptive surface which exhibits good ink holdout and minimal print mottle. In accordance with one embodiment of the invention, the layer of organic polymeric, particles contains less than about 50 percent by volume binder and less than about 30 percent by volume other pigments. In a particularly preferred embodiment of the invention, the layer contains no other pigment and only the minimum amount of binder necessary to prevent coating pick-out upon printing. In some cases, a rheology modifier or water retention aid may be desirable to improve coater runability. Smoothness is measured using the Parker Print Surface Method using a hard backing and a 5 kg/m^2 air pressure in accordance with TAPPI Standard Method T555 pm-94 and 75 TAPPI gloss is measured using TAPPI Method T480 om-92.

The paper of the present invention is advantageous because it provides a sheet having good stiffness without increasing the total basis weight of the sheet. In particular, the ink-receptive organic polymeric pigment coating typically has a dry coat weight of about 0.5 to 10 g/m^2/side and preferably about 0.5 to 5.0 g/m^2/side. The organic polymeric pigment coating is used as a replacement for a conventional coating having a coat weight of about 6 to 18 g/m^2/side. When the reduction in coat weight is replaced with fiber, i.e., a heavier basestock is used, a paper is achieved which provides better stiffness at equal basis weight, which is advantageous for magazine and catalog publishing applications, coated one side label stock, cast coated paper, annual reports, advertising brochures, and fine paper applications.

Brief Description of the Drawings

Fig. 1 is an electron microscope photograph (7,500x) of the surface of coating in accordance with the present invention showing the close packing of the organic polymeric particles;

Fig. 2 is an electron microscope photograph (10,000x) which provides a cross-section of a coating of organic polymeric particles which has been printed;

Fig. 3 is a schematic illustration of a cross-section of a coated paper in accordance with the invention showing the ink-receptive layer on an uncoated basestock; and

Fig. 4 is a schematic illustration of a cross-section of a coated paper in accordance with the invention showing the basestock fibers, the mineral pigment basecoat and the ink-receptive overcoat.

Detailed Description of the Invention

Fig. 1 is a photomicrograph of an uncalendered coating in accordance with the present invention showing the closely packed array of the organic polymeric pigment particles of the non-film forming coating. The ink layer on top of the organic polymeric coating is evident from the photomicrograph of the coating shown in Fig. 2. Fig. 3 is a schematic illustration of a coating of the invention in which the particles of the non-film forming coating are shown schematically. Fig. 3 shows the structure of the coating containing the mineral pigment basecoat overcoated with the non-film forming polymeric coating. The close packing of the particles as shown provides coatings with uniform porosity and ink receptivity which exhibit reduced print mottle.

In one manifestation of the invention, any conventional paper basestock is coated with an ink-receptive layer of organic polymeric pigment to improve print quality. The paper or paperboard is preferably formed from a web of one or more types of cellulosic paper making fibers. The fibers may be made up of hardwood, softwood or recycled fiber or mixtures thereof. In another manifestation of the invention, any conventional paper basestock is coated with a mineral pigment basecoat and overcoated with organic polymeric pigment to improve print quality. The papers and paperboards conventionally used as basestocks can have a basis weight in the range from about 30 to 700 g/m^2/side. More specifically, paper basestocks weigh about 30 to 240 g/m^2/side and paperboard basestocks weigh about 100 to 700 g/m^2/side. For use as magazine stock, the basestock preferably has a basis weight of

about 30 to 90 g/m^2/side and the total weight of the paper is about 32 to 125 g/m^2/side. The paper or paperboard is preferably formed from a web of one or more types of cellulosic paper-making fibers. The fibers may be made up of hardwood, softwood or recycled fiber or mixtures thereof.

In accordance with a preferred embodiment of the invention, a high quality, smooth paper basestock typically used as basestock for coated paper is used. As measured by the Parker Print Surface (PPS-5) Test using a hard backing and 5 kg/m^2 air pressure, the basestock has a smoothness less than about 8.00 and preferably less than about 4.50 (or a Sheffield smoothness using standard TAPPI method T538 om-96 less than about 200 and preferably less than 100 and more preferably less than 80). A particularly preferred basestock has a PPS-5 smoothness of about 3.50 to 3.80 and a Sheffield smoothness of about 50 to 60.

The organic polymeric, pigment used in the present invention can have an average particle size of about 0.1 to 5.0 microns and preferably about 0.2 to 1.5 microns. The pigment is preferably hollow and spherical, but could be of any shape. In accordance with one embodiment of the invention, the pigment is spherical as supplied but is rendered hemispherical, i.e., flat at the surface of the sheet by calendering as shown in Fig. 2. Commercial pigments that are useful in the ink-receptive layer are sold under the tradenames SARAN by Dow Chemical Company, PVDC by Kemanord, and ROPAQUE by Rohm and Haas Company. The ROPAQUE pigments have the properties and can be made by the processes described in more detail in one or more of U.S. Patents 3,784,391; 4,427,836; 4,469,825; 4,594,363; 4,798,691; 4,880,842; 4,908,271; 4,910,229; 4,972,000; and 5,135,568. The particles are characterized in that they are thermoplastic and deformable upon calendering.

More specific examples of organic polymeric pigments that are useful include Ropaque HP 1055 (average particle diameter 1.0 micron with a void volume of approximately 55%), Ropaque HP 91 (1.0 micro diameter with a void volume of 50%), Ropaque OT-62 (0.4 micron diameter with a void volume of about 33%), Ropaque OP-84

(0.55 micron diameter, void volume 20%), Ropaque OP-90 (0.45 micron diameter, 33% void volume). Solid spherical polymers which also could be used in certain embodiments of this invention are available from Gencorp, under the tradename Lytron, and from Dow Chemical. One such useful pigment is Lytron 2501 having an average particle diameter of 0.5 microns. The Ropaque particles are formed from styrene acrylic polymer, but other polymer systems as commercially available in the art may be used. In addition to using the spherical and hemispherical pigments, certain irregularly shaped organic polymeric pigments may be used. In certain applications, it may also be desirable to use a blend of organic polymeric pigments of different size, shape and/or composition.

As contrasted with the conventional use of minor amounts of organic polymeric pigments to improve the finished gloss of a layer of mineral pigment, the ink-receptive coating layer used in the invention contains at least 50% by volume of the organic polymeric pigment. In accordance with the preferred embodiment of the invention, the ink-receptive layer is composed substantially entirely of the organic polymeric pigment and a small amount of binder. Preferably the amount of binder used in the coating is no more than the minimum amount needed to prevent coating pick-out upon printing. The minimum amount of binder necessary to produce a defect free printed surface is determined by the stresses produced by a particular printing process. The coating is formulated and coated so that the interparticle spacing as measured from the center of one particle to the center of an adjacent particle is no more than about 1.0 to 2.0 times the average particle diameter. The thickness of the layer is about 1 to 40 microns and preferably about 3 to 12 microns and more preferably about 3 to 8 microns. The ink receptive coating is typically applied to each side of the basestock in an amount of about 0.5 to 10.0 g/m^2 dry weight, preferably in an amount of 0.5 to 5.0 g/m^2. The product coated with the organic polymeric particles is preferably, but not necessarily, calendered. The coated product preferably has a finished TAPPI 75 gloss (TAPPI T480 OM-92) of 40 to 110 depending on the grade of the paper.

Any one or more of the following binders may be used to bind the pigment to the basestock: water-soluble high vinyl polymers such as polyvinyl alcohol, starch, gum

arabic, gelatin, sodium alginate; styrene butadiene (SBR) latex; acrylic polymer latexes; vinyl copolymer latexes, such as ethylene-vinyl acetate copolymer, polymethyl methacrylate, polyurethane, poly(vinyl acetate); polyester resin; vinyl chloride vinyl acetate resin; alkyd resin; and polyvinyl butyral resin. The coating compositions may contain up to 50% by volume binder, but typically the composition contains much less binder, e.g., 15 to 35% by volume. Preferably the amount of binder is held to the minimum necessary to prevent coating pick-out upon printing.

In the preferred embodiments, the pigment in the coating consists of the polymeric pigment, but for some applications it may be desirable to include minor amounts of mineral pigments especially clay, calcium carbonate, or titanium dioxide. Other pigments that have been used in paper coating compositions and which may also be used in the coating include solid sphere organic polymeric pigments, talc, kaolin, diatomaceous earth, ground calcium carbonates, precipitated calcium carbonate, aluminum hydroxide, calcium hydroxide, magnesium hydroxide, calcium sulfate, bentonite, silica, amorphous silica, etc. Mineral pigments can be added to the coating in an amount up to 40% by volume. However, in order to achieve the most uniform porosity and lowest density coating by closely packing the organic polymeric pigments, the amount of non-polymeric pigment is preferably limited to no more than 10% by volume, and most preferably no non-polymeric pigment is present.

The ink-receptive coating composition may include other additives including a lubricating agent such as calcium stearate, a dispersant such as polyacrylate, and a rheology modifier such as carboxymethylcellulose in addition to the organic polymeric particles. It may be necessary to add rheology modifiers, water retention aids or other additives to provide the necessary rheology for each particular coating method. Natural and synthetic thickeners, rheology modifiers, and water retention aids used in traditional paper coatings such as starch, polyvinyl alcohol, casein, protein, carboxymethyl cellulose, hydroxyethyl cellulose, alkali-swellable acrylic emulsions, hydrophobically modified alkali-swellable acrylic emulsions, hydrophobically-modified ethylene oxide-based urethane block copolymers, vinyl acrylic

copolymer can be added to the ink-receptive coating. Optical brighteners and dyes can also be added to the coating to adjust the brightness and hue or to provide a colored paper.

In one embodiment of the invention, the ink-receptive coating consists of the binder, the hollow spherical, organic polymeric pigment and a rheology modifier. The coated paper is preferably, but not necessarily, calendered or supercalendered to a 75 ° TAPPI gloss greater than 20 and a PPS-5H smoothness less than 3.50.

Conventional basecoat compositions can be used in certain embodiments of the present invention. These coatings typically contain one or more mineral pigments and a binder and are applied in a coat weight of about 6 to 18 g/m^2/side and preferably 6 to 12 g/m^2/side. Mineral pigments that have been used in paper coating compositions which may be used in the basecoat include clay, calcium carbonate, titanium dioxide, talc, kaolin, diatomaceous earth, ground calcium carbonates, precipitated calcium carbonate, aluminum hydroxide, calcium hydroxide, magnesium hydroxide, calcium sulfate, bentonite, silica, amorphous silica, etc. Organic polymeric pigments may also be used in the basecoat, e.g., amounts up to 10% by volume may be desirable. In one embodiment of the invention, instead of using only less expensive pigments such as calcium carbonates in the basecoat, the basecoat contains quantities of more expensive pigments such as high brightness, fine clay and titanium dioxide to improve the smoothness, opacity and brightness of the sheet. Representative examples of binders that can be used in the basecoat include water-soluble vinyl polymers such as polyvinyl alcohol, starch, gum arabic, gelatin, sodium alginate; styrene butadiene (SBR) latex; acrylic polymer latexes, vinyl copolymer latexes such as ethylene-vinyl acetate copolymer, polymethyl methacrylate, polyurethane, polyester resin, vinyl chloride vinyl acetate resin, alkyd resin and polyvinyl butyral resin.

Any coater can be used to apply the organic polymeric pigment of the invention, including, for example, blade coaters, air knife coaters, roll coaters, reverse roll coaters, bar coaters, curtain coaters, die slot coaters, gravure coaters, size press coaters, Bill blade coaters, Champflex coaters, brush coaters, metering size press coaters, two roll size

press coaters, short-dwell coaters, etc. Depending upon the particular application the paper may be coated on both sides or one side only.

While the invention is principally directed to coated paper products, the coating composition of the invention can also be used on polymeric films and/or synthetic papers. for example, polyethylene terephthalate film or TYVEK® Film may be coated with a basecoat and an ink-receptive layer.

EXAMPLES 1-6 (Coated basestock)

The invention is illustrated in more detail using the following non-limiting examples of ink-receptive coating compositions.

	Material	Dry Weight Percent
Example 1	Ropaque HP1055	75
	Styrene butadiene latex	25
Example 2	Ropaque HP543	65
	Styrene butadiene latex	35
Example 3	Ropaque HP1055	70
	Starch	30
Example 4	Ropaque HP543	75
	Pensize 630	25
Example 5*	Ropaque HP1055	40
	Ropaque HP543	40
	Styrene butadiene latex	20
Example 6*	Ropaque HP1055	55
	Hydrocarb 90 calcium carbonate	10
	Styrene butadiene latex	35

*Hypothetical example

To prepare papers in accordance with the present invention, each of the foregoing compositions was dispersed in water in an amount of 0.27 g/ml and coated on a pilot coater at 726 m/min using a roll applicator with rigid blade metering on both sides of a basestock having a basis weight of 78 g/m^2/side which had been coated with a basecoat containing 91% calcium carbonate, 5% starch and 4% latex in amount of 10 g/m^2/side. The organic polymeric pigment containing coating was applied on a pilot coater at 726 m/min using a roll applicator with rigid blade metering to provide a dry coat weight of 1.5 g/m^2/side. The papers were dried and calendered at 80 C and 300 kn/m.

Example 7 (Coated basestock)

Two printing papers (Sample A and Sample B) in accordance with the invention were prepared as indicated in the table below and compared to a commercially available paper double coated on each side with a conventional coating containing clay, calcium carbonate, starch and latex to give a total coat weight of 20.8 gms/m^2/side coating. Samples A and B represent two embodiments of the present invention coated on the same mineral basecoat paper. After coating and drying, Samples A and B were calendered at 80°C and 300 kN/m. As shown in Table 1, Sample A in accordance with the invention was superior to the control in specular gloss yet it had a much lower coat weight. Sample B provided comparable specular gloss at much lower coat weight. Both Samples A and B provided significantly higher stiffness at lower overall basis weight.

Table 1

	Sample A	**Sample B**	**Control**
Basecoat formulation	91% Hydrocarb 90 5% PG270 starch 4% Dow 316 latex	91% Hydrocarb 60 5% PH270 starch 4% Dow 316 latex	NA
Basecoat weight (g/m^2/side)	9.9	10.4	10.4

	Sample A	Sample B	Control
Topcoat formulation	25% Dow 383 latex 75% Ropaque 1055	25% Penford 280 starch 75% Ropaque 1055	NA
Topcoat weight (g/m^2/side)	1.9	1.5	10.4
75 TAPPI gloss	89.7	79.2	79.7
Smoothness PPS-5H	1.80	2.32	0.98
TAPPI brightness	85.2	82.7	84.9
Opacity	92.2	93.6	93.1
High pressure Gurley porosity (T536 om-96)	664	336	607
Web offset printed 75 TAPPI gloss 100% black	92.7	81.6	92.3
Total basis weight (g/m^2)	98.7	96	105.4
Caliper	3.52	3.62	3.15
Gurley stiffness (md)	197	204	166

Examples 8-13 (Uncoated basestock)

The invention is illustrated in more detail by the following limiting examples of ink-receptive coating compositions.

	Material	Dry Weight Percent
Example 8	Ropaque HP1055	75
	Styrene butadiene latex	25
Example 9	Ropaque HP543	65
	Styrene butadiene latex	35
Example 10	Ropaque HP1055	70
	Starch	30

Example 11	Ropaque HP543	75
	Pensize 630	25
Example 12*	Ropaque HP1055	40
	Ropaque HP543	40
	Styrene butadiene latex	20
Example 13*	Ropaque HP1055	55
	Hydrocarb 90 calcium carbonate	10
	Styrene butadiene latex	35

*Hypothetical example

To prepare papers in accordance with the present invention, each of the compositions was dispersed in water in an amount of 0.27 g/ml and coated on pilot coater at 725 m/min using roll applicator with rigid blade metering on both sides of a basestock having a basis weight of 66 g/m^2 to provide a coat weight of 1.5 g/m^2/side. Samples A and B were calendered at 80°C and 300 kN/m. The papers were dried and calendered at 80°C and 300 kn/m.

Example 14 (Uncoated basestock)

Two papers (Sample C and Sample D) were prepared as defined in the following table and compared to a commercially available paper coated with conventional paper coating containing clay, calcium carbonate, starch and latex at a coat weight of 10.4 gms/m^2/side, which is used as a control. The results are shown in Table 2 and indicate that the coating of the present invention affords a high gloss, enamel grade publishing paper with increased stiffness at lower basis weight relative to the control.

Table 2

	Sample C	**Sample D**	**Control ***
Coating Formulation	25% Dow 383 latex 75% Ropaque 1055	25% Dow 383 latex 75% Ropaque 1055	see note below

	Sample C	Sample D	Control *
Coat weight (gms/m^2/side)	2.8	2.7	10.4
75 TAPPI Gloss	68.9	71.1	71.5
Smoothness PPS-5 H	3.48	1.82	1.25
High pressure Gurley porosity (sec/10cc) (T536 om-96)	96	111	551
Sheet offset printed 75 TAPPI gloss 100% black ink	70.0	75.9	88.9
Basis Weight (gms/mM^2)	81.0	64.8	76.8
Basestock Smoothness PPS-5H	7.53	3.58	
Sheffield Smoothness	184	54	
Caliper (mils)	3.46	2.62	2.39
Gurley stiffness (md)	148.2	75.9	65.6

*The Control is a commercially available paper coated with mineral pigment and binder.

Having described the invention in detail, it will be apparent that numerous modifications and variations are possible without departing from the spirit and scope of the following claims.

What is claimed is:

1. A paper comprising a cellulose fiber basestock, said basestock being coated on at least one surface thereof with a layer of an ink-receptive coating containing at least 50% by volume hollow, organic polymeric particles, said basestock having a basis weight of about 30 to 200 g/m^2.

2. The paper of claim 1 wherein said particles have an average particle size of about 0.1 to 5.0 microns and are closely spaced such that the average spacing of the organic polymeric hollow sphere particles, center to center, is about 1.0 to 2.0 times the average particle size of the particles.

3. The paper of claim 1 wherein said ink-receptive coating has a thickness of about 1 to 40 microns.

4. The paper of claim 1 wherein said ink-receptive coating is present on said basestock in an amount of about 0.5 to 10 g/m^2/side.

5. The paper of claim 2 wherein the finished paper has a PPS-5H smoothness less than about 3.50, and a 75 ° TAPPI gloss of greater than 20.

6. The paper of claim 1 wherein said ink-receptive coating contains a binder in an amount up to about 50 percent by volume.

7. The paper of claim 6 wherein the particles at the outer surface of said ink-receptive coating have a substantially hemispherical shape.

8. The paper of claim 1 wherein said ink-receptive coating contains up to about 30 percent by volume of other pigments.

9. The paper of claim 1 wherein said organic polymeric particles are spherical or hemispherical.

10. The paper of claim 5 wherein said ink-receptive coating contains about 15 to 40 percent binder.

11. The paper of claim 1 wherein said ink-receptive coating has substantially the structure shown in Fig. 1.

12. The paper of claim 1 wherein said ink-receptive coating includes up to 10 percent by volume of other pigments.

13. The paper of claim 1 wherein said ink-receptive coating consists essentially of said organic polymeric particles, a binder, and optionally a rheology modifier, said binder being present in an amount sufficient to prevent coating pick-out upon printing.

14. The paper of claim 1 wherein said ink-receptive coating is free of other pigment.

15. The paper of claim 1 wherein said ink-receptive coating consists of said organic polymeric particles, a binder and a rheology modifier.

16. The paper of claim 1 wherein said ink-receptive coating is provided on both surfaces of said basestock.

17. A magazine or catalog comprising pages made from the paper of claim 1.

18. A paper or paper board comprising a cellulose fiber basestock, a mineral pigment containing basecoat on at least one surface of said basestock and an ink-receptive coating of organic polymeric non-film forming particles overlying said basecoat.

19. The paper or paperboard of claim 18 wherein said organic polymeric particles are hollow.

20. The paper or paperboard of claim 19 wherein said ink-receptive coating has a thickness of about 1 to 40 microns.

21. The paper or paperboard of claim 20 wherein said basestock has a basis weight of about 30 to 700 g/m^2.

22. The paper or paperboard of claim 21 wherein said organic polymeric particles have an average particle size of about 0.1 to 5.0 microns and are closely spaced such that the average spacing of the organic polymeric particles, center to center, is about 1.0 to 2.0 times the average particle size of the said particles.

23. The paper or paperboard of claim 22 wherein the paper has a calendared smoothness (PPS-5H) less than about 3.50 and TAPPI 75 ° gloss greater than 20.

24. The paper or paperboard of claim 18 wherein said ink-receptive coating contains binder in an amount up to about 50 percent by volume.

25. The paper or paperboard of claim 21 wherein the particles at the outer surface of said ink-receptive coating have a substantially hemispherical shape.

26. The paper or paperboard of claim 25 wherein said ink-receptive coating contains up to about 30 percent by volume of a mineral pigment.

27. The paper or paperboard of claim 21 wherein said basestock is paper having a basis weight of about 30 to 240 g/m^2.

28. The paper or paperboard of claim 21 wherein said basestock is paperboard having a basis weight of about 100 to 700 g/m^2.

29. The paper or paperboard of claim 24 wherein said ink-receptive coating contains about 15 to 35 volume percent binder.

30. The paper or paperboard of claim 18 wherein said ink-receptive coating has substantially the structure shown in Fig. 1.

31. The paper or paperboard of claim 21 wherein said ink-receptive coating includes up to 10 percent by volume of a mineral pigment.

32. The paper or paperboard of claim 21 wherein said ink-receptive coating consists essentially of said organic polymeric particles and a binder, said binder being present in the approximately the minimum amount sufficient to prevent coating pick-out upon printing.

33. The paper or paperboard of claim 21 wherein said ink-receptive coating is essentially free of mineral pigment.

34. The paper or paperboard of claim 21 wherein said ink-receptive coating consists of said organic polymeric particles, a binder and a rheology modifier.

35. The paper or paperboard of claim 18 wherein said ink-receptive coating and said basecoat are provided on both surfaces of said basestock.

36. The paper or paperboard of claim 21 wherein the organic polymeric pigment is a hollow, thermally deformable spherical pigment.

37. The paper of claim 36 wherein said coating of organic polymeric pigment is essentially free of mineral pigment.

38. A paper useful in printing magazines or catalogs which comprises a cellulosic fiber basestock having a basis weight of about 30 to 90 g/m^2, said basestock being coated on both surfaces with a mineral pigment basecoat in an amount per coating of about 6 to 18 g/m^2/side, and an ink-receptive coating of an organic polymeric pigment in an amount per coating of about 0.5 to 10 g/m^2/side.

39. A magazine, report, yearbook, brochure or catalog in which the pages are formed from the paper of claim 20.

40. A label formed from the paper of claim 1 and coated on one side with said basecoat and said ink-receptive coating.

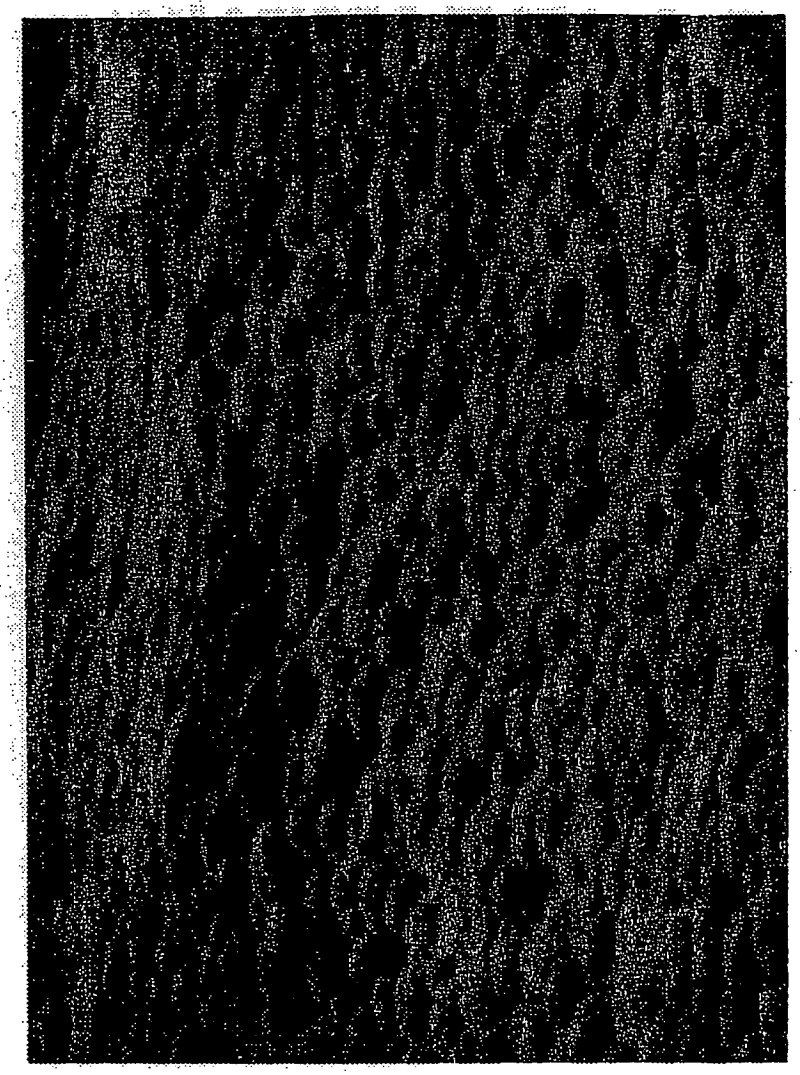

FIG. 1

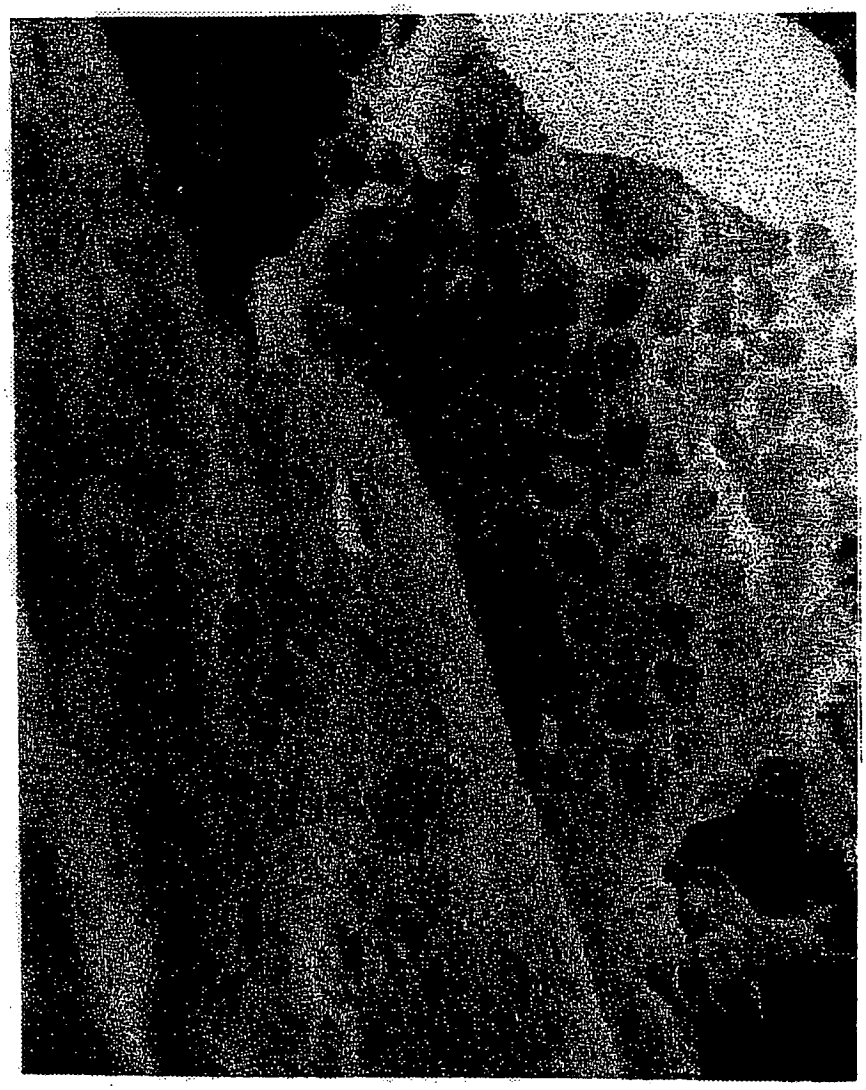

FIG. 2

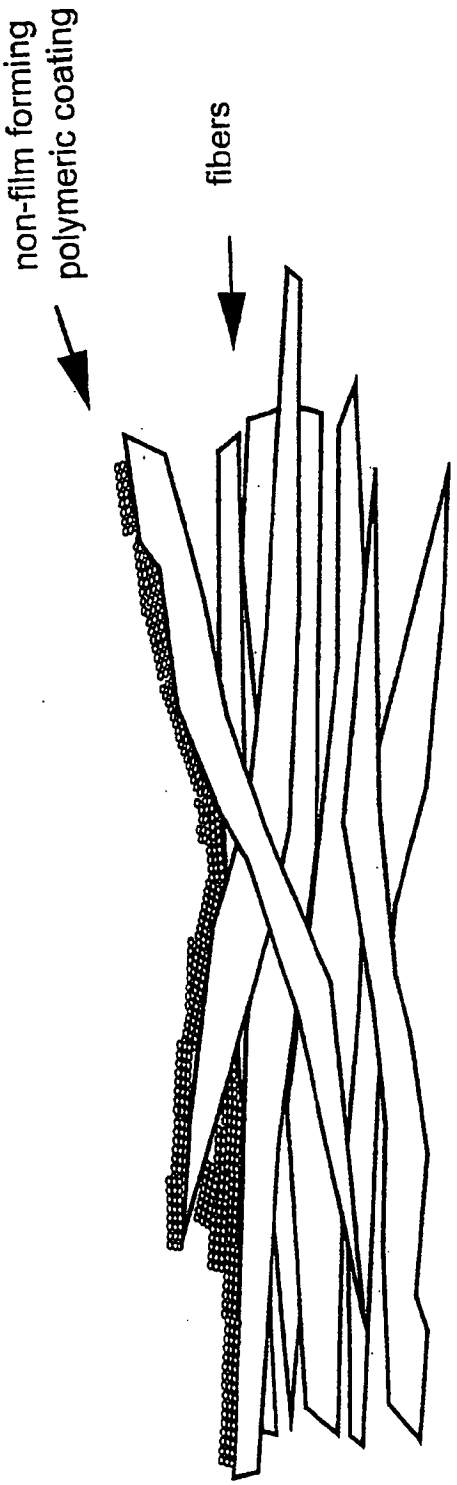

FIG. 3

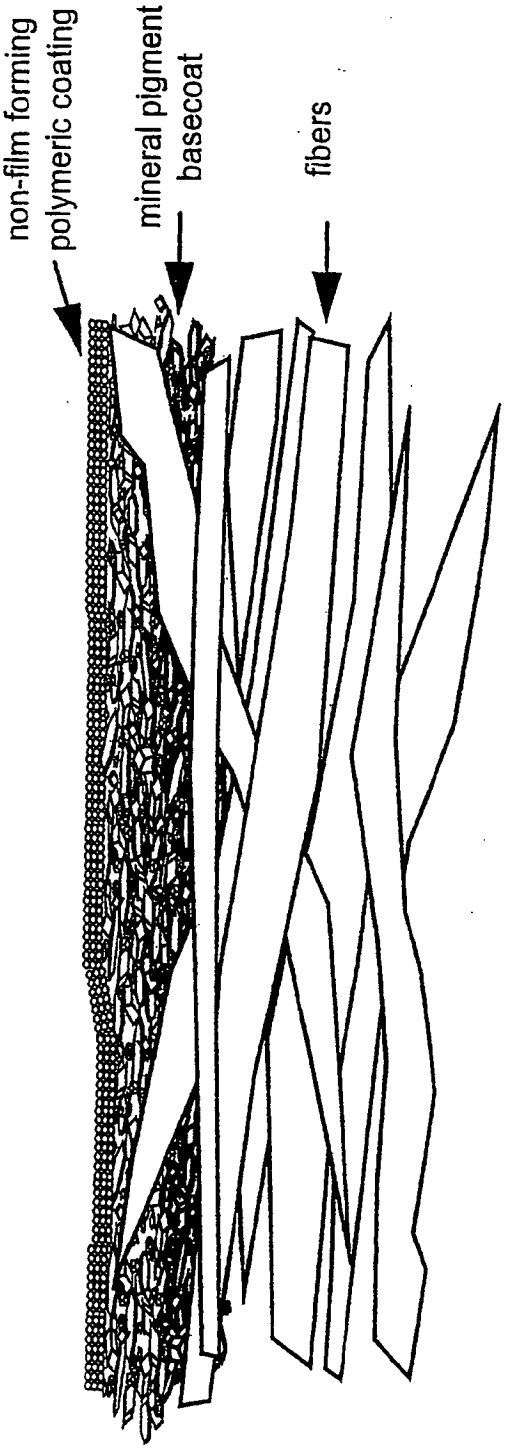

FIG. 4

INTERNATIONAL SEARCH REPORT

Int. tional Application No
PCT/US 99/12160

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 D21H19/82 B41M5/00 //D21H19:38,D21H19:42

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 D21H B41M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 360 657 A (KANO ISAO ET AL) 1 November 1994 (1994-11-01) the whole document ---	1-40
A	DE 195 24 528 A (JUJO PAPER CO LTD) 11 January 1996 (1996-01-11) the whole document ---	1-40
A	EP 0 825 296 A (OJI PAPER CO) 25 February 1998 (1998-02-25) example 10 ---	9,14
A	WO 98 20201 A (WARREN S D CO) 14 May 1998 (1998-05-14) the whole document ---	1-40
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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
31 August 1999	06/09/1999

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Songy, O

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C.(Continuation)· DOCUMENTS CONSIDERED TO BE RELEVANT

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